Heinrichs

Variable-Area Flowmeter

BGN

Device Description

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WE'VE GOT HART FIELD COMMUNICATIONS PROTOCOL ABILITY

Contents

1 Identification

1.1 Supplier/manufacturer

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Internet: http://www.heinrichs-mt.com/
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1.2 Product type

Flowmeter in all-metal design based on the float principle

1.3 Product name

BGN with subgroups
BGN-S (stainless steel)
BGN-P (PTFE)
BGN-H (Hastelloy)

1.4 Issue date

08/27/2007

1.5 Version no.

3.0
File: BGN_GB_03_eng

2 Applications

The BGN meter is suitable for flow measurement of liquid or gaseous products in pipes. It shows the current flow rate in volume or mass per unit in time.

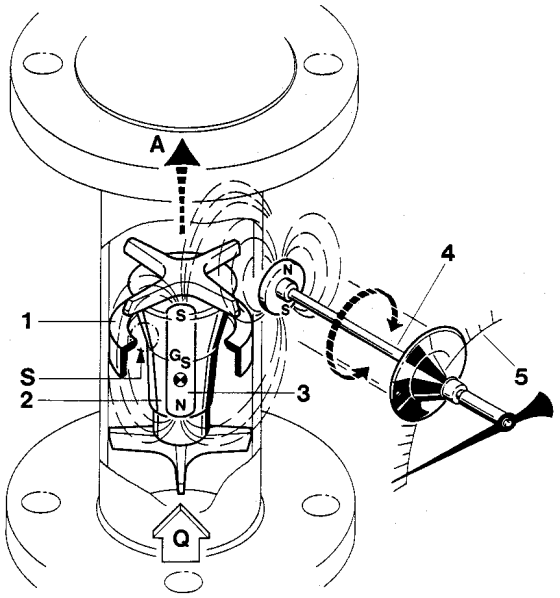
Applications: flow measurement, dosing, monitoring, adjusting and control of liquid and gaseous products. The meter's design makes it ideal for processes under difficult and adverse operating conditions.

The devices are available with additional electrical equipment for process monitoring and control.

3 Operational mode and system design

3.1 Measuring principle

The measuring element consists of a sharp-edged measuring ring (1) and a conical float (2). A medium flows from the bottom to the top through the measuring ring, lifting the float until the buoyancy force (A) and the weight of the float (Gs) establish equilibrium. As the height of the float varies, an annular clearance (S) proportional to the flow appears between the float and the measuring ring. The height of the float in the measuring ring is a measure of the flow. The permanent magnet (3) embedded in the float then transmits this measure to the scale and the optional electronic evaluators through a magnet tracking indicator system (4).



3.2 System design

The meter consists of a cylindrical fitting pipe with flange connections on both sides. For the measuring range from 5 to 50 l/h, a measuring ring is inserted in the tube in which a conical float can move with vertical freedom. For small measuring ranges of up to 4–40 l/h, the measuring cell consists of a conical measuring tube with cylindrical float.

The height of the float resulting from the flow rate is transmitted in a rotary motion by a built-in permanent magnet through a magnet tracking indicator system in a rotation to the pointer axis of the analog indicator unit.

4 Input

4.1 Measured variable

Volume flow

4.2 Measuring range (lower-range and upper-range value)

The lower-range value is considered 10% of the upper-range value. Measuring range span: 10-100%
Smallest measuring range: 0.5-5.0 l/h water
Largest measuring range: 8.000-80.000 l/h water (stainless steel)

4.3 Measuring range table

Nominal size (DN)	Measuring range	Measuring range for water at 1000 kg/m3		Measuring range for air at 1.013 bars absolute pressure		Pressure loss (mbar)	Remarks
15	A	0.5– 5.0	l/h	0.015 – 0.15	m^3/h	40	1)+2)
	B	1.0 – 10	l/h	0.03 – 0.30	m^3/h	44	1)+2)
	C	1.6 – 16	l/h	0.045 – 0.48	m^3/h	40	1)+2)
	D	2.5 – 25	l/h	0.075 – 0.75	m^3/h	40	+2)
	E	4.0 – 40	l/h	0.13 – 1.3	m^3/h	40	+2)
	F	5.0 – 50	l/h	0.15 – 1.5	m^3/h	40	
	G	7.0 – 70	l/h	0.2 – 2.1	m^3/h	40	
	H	10 – 100	l/h	0.3 – 3.0	m^3/h	60	
	I	16 – 160	l/h	0.5 – 4.6	m^3/h	60	
	J	25 – 250	l/h	0.7 – 7.0	m^3/h	60	
	K	40 – 400	l/h	1.0 – 11	m^3/h	70	
	L	60 – 600	l/h	1.7 – 17	m^3/h	80	
	M	100 – 1000	l/h	3 – 30	m^3/h	60	5)
	N	160 - 1600	l/h	4 – 46	m^3/h	70	5)
	P	250 – 2500	l/h	7 – 70	m^3/h	100	5)
25	A	0.5 – 5.0	l/h	0.015 – 0.15	m^3/h	40	1)+2)
	B	1.0 –10	l/h	0.03 – 0.30	m^3/h	40	1)+2)
	C	1.6 –16	l/h	0.045 – 0.48	m^3/h	40	1)+2)
	D	2.5 – 25	l/h	0.075 – 0.75	m^3/h	40	+2)
	E	4.0 – 40	l/h	0.13 – 1.3	m^3/h	40	+2)
	F	5.0 – 50	l/h	0.15 – 1.5	m^3/h	40	
	G	7.0 – 70	l/h	0.2 – 2.1	m^3/h	40	
	H	10 – 100	l/h	0.3 – 3.0	m^3/h	60	
	I	16 – 160	l/h	0.5 – 4.6	m^3/h	60	
	J	25 – 250	l/h	0.7 – 7.0	m^3/h	60	
	K	40 – 400	l/h	1.0 – 11	m^3/h	70	
	L	60 – 600	l/h	1.7 – 17	m^3/h	80	
	M	100 – 1000	l/h	3 – 30	m^3/h	60	
	N	160 – 1600	l/h	4 – 46	m^3/h	70	
	P	250 – 2500	l/h	7 – 70	m^3/h	100	
	Q	400 – 4000	l/h	11 – 110	m^3/h	240	3)+ 4)
40	P	250 – 2500	l/h	7 – 70	m^3/h	50	3)
	Q	400 – 4000	l/h	11 – 110	m^3/h	120	3)
	R	600 – 6000	l/h	17 – 170	m^3/h	180	3)
50	Q	400 – 4000	l/h	11 – 110	m^3/h	80	
	R	600 – 6000	l/h	17 – 170	m^3/h	90	
	S	1000 – 10000	l/h	29 – 290	m^3/h	110	
	T	1600 –16000	l/h	46 – 460	m^3/h	230	
	U	2500 – 25000	l/h	70 – 700	m^3/h	500	3)+ 4)
80	T	1600 – 16000	l/h	46 – 460	m^3/h	70	
	U	2500 – 25000	l/h	70 – 700	m^3/h	100	
	V	4000 – 40000	l/h	110 – 1100	m^3/h	350	
100	V	4000 – 40000	l/h	110 – 1100	m^3/h	120	
	W	6000 – 60000	l/h	170 – 1700	m^3/h	360	
	X	8000 – 80000	l/h	240 - 2400	m^3/h	600	3)+ 4)

1) for P version (PTFE), float with tantalic collar, cone of borosilicate glass
measuring range: A 0.7–7.0 l/h, B 1.2–12 l/h, C 2.0–20 l/h
2) gas throttle in S version for gas measurement included in price (pressure loss 200 mbar)
3) not available in P version
4) conversion not possible
5) only in S and H version, only with smaller sealing strip

5 Output

Various electrical contact makers or transmitters may be installed in the indicator unit.

5.1 Binary output

Using the segments of the slot-type initiators or the eccentric discs of the microswitches, any switching point between 10% and 90% of the flow rate can be set.

5.1.1 KEI 1 or KEI 2 limit transducers

1 or 2 limit transducers,
type SJ 3,5N, make Pepperl+Fuchs
(special switch possible, e.g. SN version)
Safety class: PTB Nr. 99 ATEX 2219 X
PTB Nr. 00 ATEX 2048 X

5.1.2 KEM 1 or KEM 2 limit transducers (special version)

Double-throw microswitches whose switching point is activated by a cam plate.
KEM 1 = 1 Double-throw microswitch
KEM 2 = 2 Double-throw microswitches

Maximum make-break capacity:

230 VAC 50/60Hz	6 A
24 VDC	0.5 A
110 VDC	0.2 A

5.2 Analog output with the ES magneto-electric transmitter

The magneto-electric transmitter is factory-calibrated to the scale values upon shipment. The signal output is supplied exclusively in a two-wire connection at 4-20 mA. Normally, the 4-20 mA signal has the HART® protocol; alternatively it can have PROFIBUS PA.

Additional options: 2 limit values, alternatively 1 limit value and 1 pulse output

The signal output and the limit values can be configured using a HART® modem operating on the following configuration programs: SensorPort from Bopp & Reuther, PDM from Siemens or AMS from Rosemount. Furthermore, a HART® hand-held terminal (with DD software) can also be used. For more information about configuration, please refer to the separate Operating Instructions for the ES.

Safety class: DMT 00 ATEX 075 / II2G EEx ia IIC T6

When installing electrical equipment in hazardous areas, the conditions and provisions specified in the approval docmuments must be followed.

5.3 Analog output with the KINAX 3W2 angle-of-rotation transmitter

The signal output of the angle-of-rotation transmitter is factory-calibrated to the scale values. The signal output is 4-20 mA in 2-wire connection; or alternatively 0-20 mA in 4- or 3-wire connection. The signal output of 4 mA corresponds to the flow rate scale value of 0 (0 mA for the 0-20 mA version). 5.6 mA corresponds to 10% of the flow rate scale value (2 mA). 20 mA corresponds to 100% of the flow rate scale value.

Use in hazardous areas:
The angle-of-rotation transmitter is a component approved for hazardous areas. When used in hazardous areas, all the values and instructions indicated in the certificate of approval must be observed. Auxiliary power is fed through an approved intrinsically safe circuit of 12-30 V. To prove intrinsic safety, only authorized electrical equipment may be interconnected. Please take note of the maximum permissible ambient temperature of 60°C/75°C for the transmitter and the process temperature.

Safety class:
PTB 97 ATEX 2271 / II 2G EEx ia IIC T6

6 Characteristic values

6.1 Measuring accuracy

6.1.1 Reference conditions

Water 20°C

6.1.2 Measured error

(for liquids)
BGN-S/H/P +/- 1.6% of URV for local display
(URV = upper-range value)

(for gases)
BGN-S/H/P +/- 2.0% of URV for local display

Additional inaccuracy for:
ES = +/- 0.2%
KINAX 3W2 = +/- 0.5%

6.1.3 Repeatability

+/- 0.5 % of upper-range value

6.2 Influence of ambient temperature

1. Without electrical equipment and with limit transducer without influence
2. With KINAX transmitter:
   +/- 0.2 % / 10 K reference temperature 23°C
3. With ES transmitter:
   +/- 0.5 % / 10 K reference temperature 22°C

6.3 Influence of fluid temperature

Deviations in fluid temperature from the temperature observed during calibration can result in a proportional display fault because of the corresponding change in density. Changes in viscosity cause a non-linear display fault.

7 Conditions of use

The VDI/VDE guidelines 3513, Sheet 3, must be observed. The meter is suitable for :

1) Liquids with sufficient flowability that are free of solids, do not bond and do not tend to settle.
2) Gases with linear flow behavior and an adequate inlet pressure.

7.1 Mounting requirements

The mounting location must be suitable for a vertical direction of flow from the bottom to the top.

Important: If that is impossible, then the device type **BGF** may be utilized. This device can be used for both horizontal and vertical direction of flow.

The limit values for temperature and air humidity at the mounting location must be maintained. Avoid corrosive atmospheres. If this cannot be avoided, ventilation must be installed.

Please make sure that there is adequate clearance from parts that might cause magnetic interferences such as solenoid valves and ferromagnetic components like steel brackets/supports. We recommend that the minimum lateral distance between two adjacently mounted devices be **300 mm**. The devices can be mounted close together if vertically offset by one device length. The minimum lateral clearance for interfering steel parts should be **200 mm**. In case of doubt, check the interference by moving the device back and forth in the selected distance by about 200 mm and testing whether the pointer position changes.

Select the mounting location so as to enable a reliable reading of the scale values. Please take note as well of the space requirement for any possible disassembly of the device. As a rule, inlet and outlet sections in front of and behind the device are unnecessary if the medium has a linear flow profile. Avoid mounting accessories converging on one side in front of the device. However, if this is indispensable maintain a minimum device length of 250 mm as an inlet section.

The nominal size of the pipes to be connected must correspond to that of the meter. Avoid fittings converging on one side directly in front of the device. As a rule, install valves behind the measuring equipment if there are gases involved.

7.1.1 Mounting/start-up

The device must be mounted in accordance with the direction of flow from the bottom to the top (perpendicularly). Please observe the prior reference to the BGF-type device.

The nominal size of the device and that of the pipes must be the same. The pressure stages and, hence, the dimensions of the flanges must coincide. The surface roughness of the flange sealing surface must be suitable for the prescribed gaskets.

Please check whether possible accessories like spring stops, gas/liquid-type dampers are still correctly sitting on the flange. Check whether the mounting clearance between the flanges of the pipes corresponds to the assembly dimension of the device plus two gaskets. To achieve stress-free mounting, the flanges of the pipes must be aligned parallel to each other.

Use connecting bolts and gaskets in the prescribed dimensions. The gaskets must be suitable for the operating pressure, the temperature and the measured medium. With PTFE-coated devices, use gaskets whose interior and exterior diameter correspond to the sealing strip of the device.

Tighten the screws crosswise so that the process connections are tight. See to the tightening torques of screws especially with PTFE-coated devices.

The maximum torques for PTFE-coated devices are: DN15/DN25 = 14 Nm/DN50 = 25 Nm/DN80 = 35 Nm/DN100 = 42 Nm (following VDI/VDE Guideline 3513).

Please check whether the pipe is adequately stable to rule out the possibility of vibration or swinging of the device. (Do not use steel mounting parts on the device.)

When gas is used as the medium, pay special attention to the position of the valve. If the device is calibrated to more than 1.013 bars absolute pressure, the valve is usually installed behind the flowmeter. At 1.013 bars absolute pressure (free exhaust) install it in front of the device.

If there is risk of dirt or solid matter penetrating the process pipes, flush them beforehand so that these materials do not get caught in the device. Ferromagnetic solid matter such as spatter can lead to the breakdown of the device. If these materials are still present during normal operating conditions, mount a magnetic filter (accessory) in front of the device. When using liquids, flush to avoid a surge of gas bubbles. Slowly increase the supply pressure when using gases to prevent pressure surges. Basically, avoid activation using solenoid valves to prevent the float from shooting upwards.

7.1.1.1 Gas measurement

When using gases, slowly let the operating pressure rise. At the same time, vary the operating pressure through a setting valve so that the float is not knocked around since otherwise this would damage the measuring element.

7.1.2 Device settings

The measuring equipment is delivered ready for operation according to your order specifications. **The limit transducers** are set to the desired values. If you have submitted no requirements, the basic setting for

1 contact device: - Minimum contact switching point at 10% of descending flow (damped/closed-circuit principle).

2 contact devices: Minimum contact switching point at 10% of descending flow and maximum contact switching point at 90% of ascending flow.

7.1.3 Adjusting the limit transducer

The contacts are adjustable through the contact position indicators located on the scale. Dismantle the indicator cover, unfasten the contact position indicators, set to the desired value and reattach them.

7.1.4 Operation in hazardous areas

7.1.4.1 Without electrical equipment

The basic version of the flowmeter is a *non-electrical device* without its own ignition sources and meets DIN EN 13463-1 requirements. It can be used in hazardous areas that require Category 2 equipment.

Marking: II 2GD c
Reg. Nr.: BVS 03 ATEX H/B 112
Tech. File Ref. 03-02 X

Since the device does not have its own power sources that would result in a temperature increase, the fluid temperature is decisive for the maximum surface temperature.

When used in potentially explosive dust atmospheres, the device must be cleaned regularly in order to avoid deposits exceeding 5 mm.

7.1.4.2 With built-in electrical limit transducers

When the limit transducers are installed, the device becomes an electrical assembly and receives a marking in accordance with DIN EN 50014 from the entire device with the built-in electrical limit transducers.

The electrical and thermal data and the special conditions of the EC Type Examination Certificate of the built-in limit transducers must be observed (see also the diagram in Section 7.3.2).

The influence of the fluid temperature on the built-in limit transducers must be observed. The overtemperature of the maximum fluid temperature based on the maximum ambient temperature must be considered with a factor according to the following table:

Nominal size	Factor for standard version	Factor for the device with the indicator pulled forward
DN15 and DN25	0.2	0.07
DN40 and DN50	0.25	0.085
DN80 and DN100	0.3	0.1

Example for built-in limit transducer for DN 15 and DN 25:

Max. ambient temperature T_{amb} = 40°C
Max. fluid temperature T_m = 120°C
Factor for brought-in heat F = 0.2
Temperature class T4

$T_ü$ = Overtemperature
T_a = Ambient temperature of limit transducer

$$Tü = Tm - Tamb = 120°C - 40°C = 80°C$$
$$Ta = Tü * F + Tamb = 80°C * 0{,}2 + 40°C = 56°C$$

In accordance with the tables in the PTB 99 ATEX 2219 X EC Type Examination Certificate, the SJ 3,5-... N... inductive sensor must be operated in the T5 temperature class with an intrinsically safe circuit that does not exceed the maximum values of the Type 3 circuit.

When using the device in hazardous areas, follow the applicable national installation rules.

Example for calculating the max. fluid temperature based on the max. ambient temperature for the built-in sensor Type ES for DN 15/25.

T_a = 70°C
T_{amb} = 60°C
F = 0.2

$$Tm = \left(\frac{Ta - Tamb}{F}\right) + Tamb = \left(\frac{70°C - 60°C}{0{,}2}\right) + 60°C = 110°C$$

7.1.4.2.1 Marking for the device when the SJ 3,5...N... limit transducer is built in

PTB 99 ATEX 2219 X
II 2G EEx ia IIC T6-T4

7.1.4.2.2 Marking for the device when the ES magneto-electric transmitter is built in

DMT 00 ATEX 075
II2G EEx ia IIC T6

7.1.4.2.3 Marking for the device when the KINAX 3W2 angle-of-rotation transmitter is built in

PTB 97 ATEX 2271
II 2G EEx ia IIC T6

7.2 Ambient conditions

7.2.1 Ambient temperature ranges

Without electrical accessories:
-40°C to +80°C
With limit transducer:
-40 °C to +65°C
With KINAX signal output:
-40°C to +60°C
With ES signal output:
-40°C to +70°C

For the hazardous area version, take note of the maximum ambient temperatures depending on the temperature class as specified in the Type Examination Certificate.

7.2.2 Storage temperature

The storage temperatures are identical to the ambient temperature ranges.

7.2.3 Climatic category

Weather-protected and/or unheated locations, class C

7.2.4 Degree of protection

IP 65

7.2.5 Shock resistance/vibration resistance

The meter should be protected from extreme shocks and vibrations, which could cause damage.

7.2.6 Electromagnetic compatibility

EN 61000-6-2:1999 Immunity industrial environment
EN 50081-1 Emitted interference residential environment
EN 55011:1998+A1:1999 Group 1, Class B
NAMUR recommendation NE 21

7.3 Fluid conditions

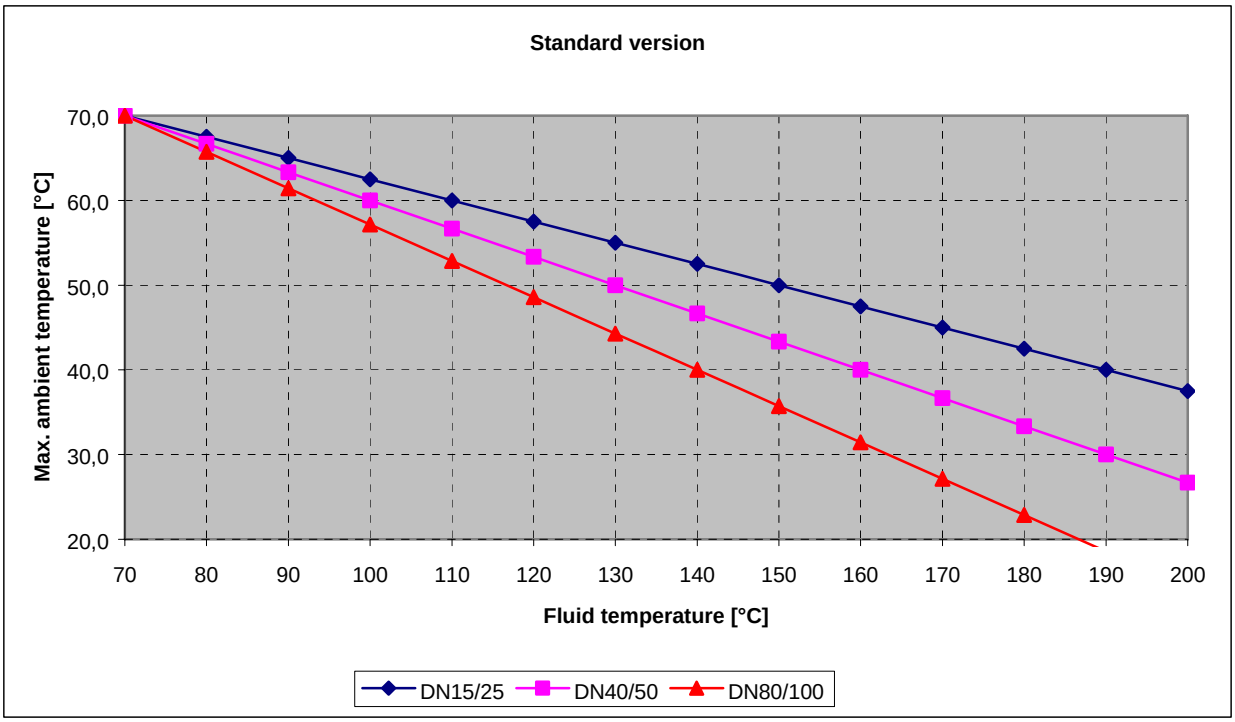
7.3.1 Fluid temperature ranges

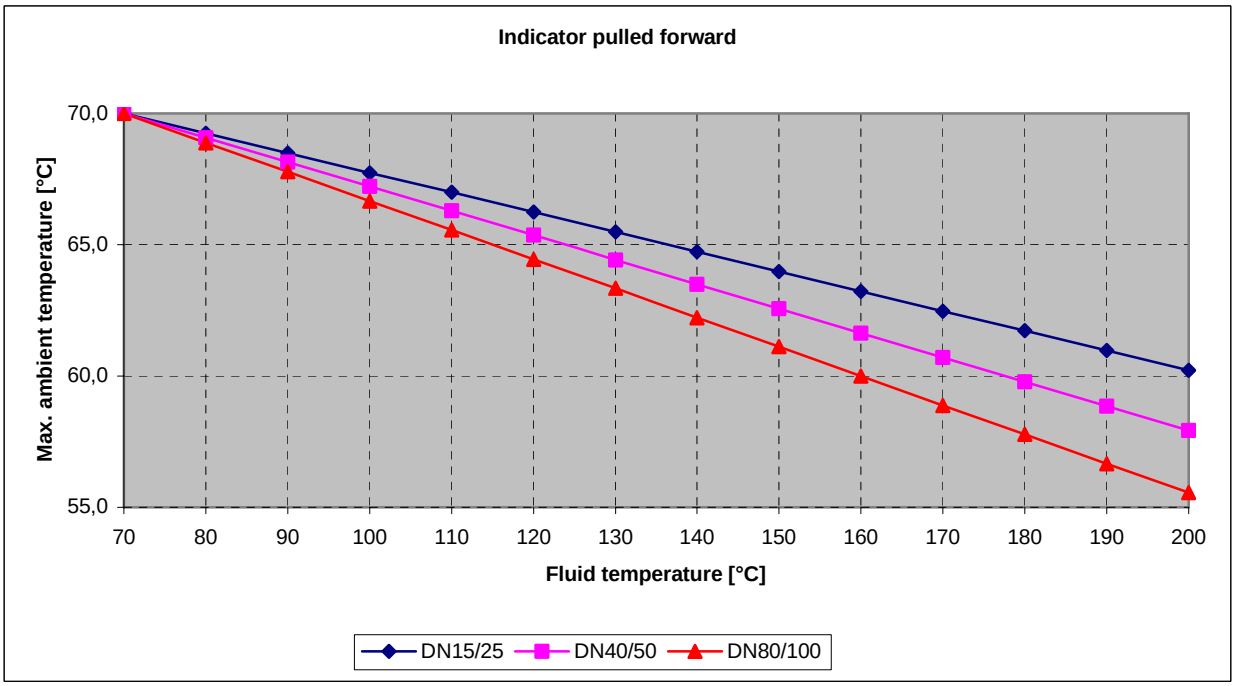
BGN-S/H : - 40°C to +200°C

Special design: -80°C to +350°C

BGN-P : - 20°C to +125°C

7.3.2 Diagrams: Max. ambient temperature based on the fluid temperature for the ES





7.3.3 Fluid pressure limit

Standard design BGN-S/H – DN 15/25/40/50/80 PN 40;
DN 100 PN 16
Special design – up to PN 400
BGN-P – DN 15/25/50/80/100 PN 16

7.3.4 Inlet and outlet sections

Inlet and outlet sections are not required for a linear flow profile of the fluid. For an extremely non-linear flow profile (e.g. shut-off/control valves are located in front of the meter), we recommend an inlet section with a mounting length of 250 mm (see also guidelines in accordance with VDI/VDE 3513).

7.3.5 Physical state

Liquid or gaseous

7.3.6 Density

Liquids: up to 2.0 kg/l
Gases: no restrictions

7.3.7 Viscosity

The influence of viscosity depends on various factors. Therefore, it must be calculated for each application.

7.3.8 Pressure (for gas measurement)

The measured values only apply to the calibrated fluid data stated on the scale. Any change or deviation in pressure will cause a display fault.

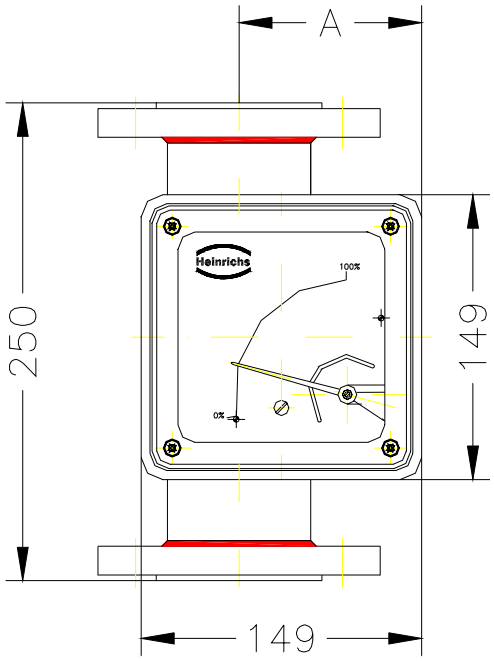
7.3.9 Pressure loss

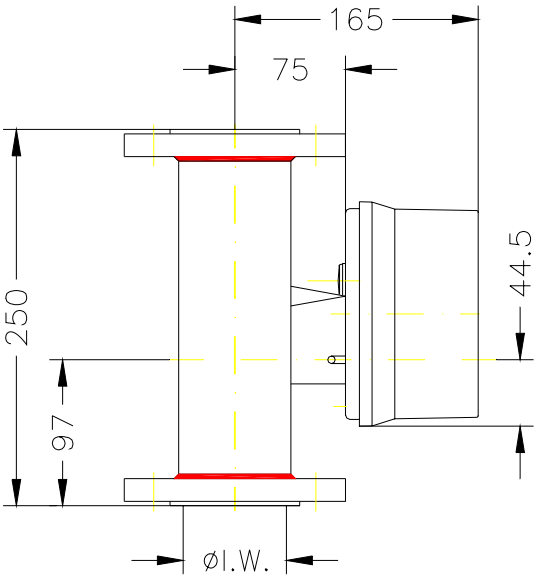
Depends on the meter size and the measuring range (see Measuring range table).

8 Construction details

8.1 Type of construction/dimensions

8.1.1 Aluminum indicator housing

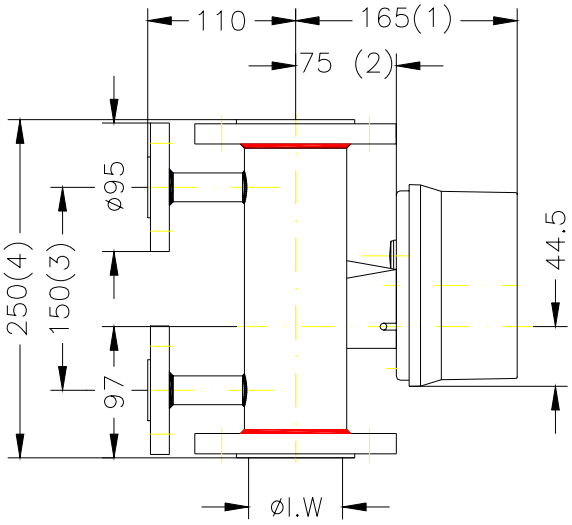




Dimensions:

DN	PN	Inside diameter	A
15	40	26	74
25	40	32	77
40	40	46	88
50	40	70	97
80	16	102	113

8.1.2 Dimension drawing for heating connection



Deviating mounting dimensions:

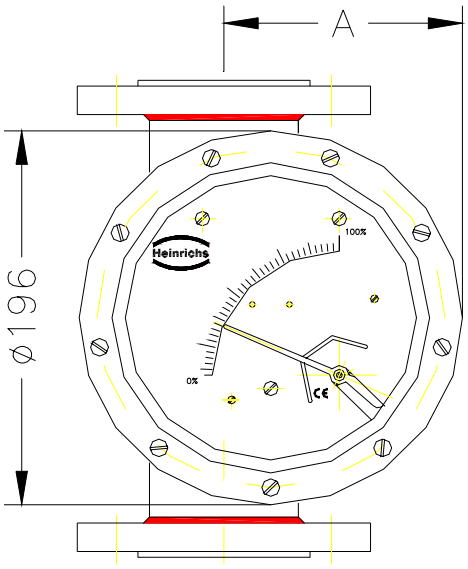
(1) With preceding magnetic filter, 50 mm longer plus 2 gaskets
(2) 265 mm with the indicator pulled forward
(3) 175 mm with the indicator pulled forward
(4) For special design DN 100: 120 mm

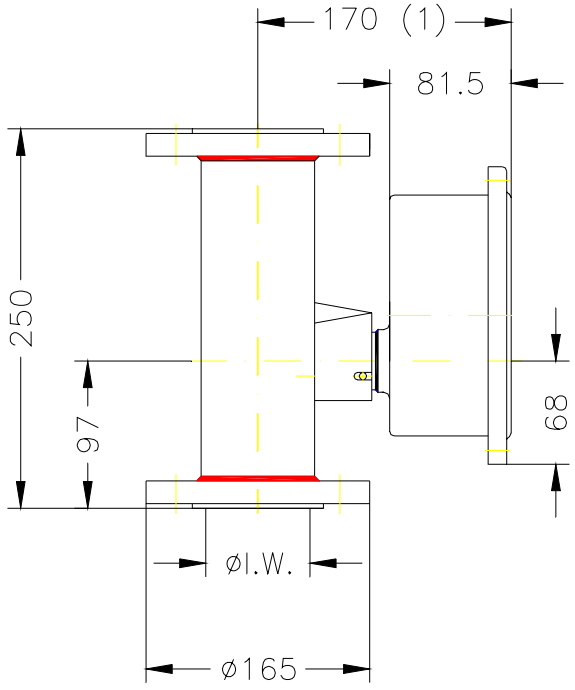
8.1.2.1 Connections for heating jacket

Pipe for	Ermeto 12 mm	
Flange in acc. with DIN	DN 15 or DN 25	PN 40
Flange in acc. with ANSI	½“	150 lbs

The DN 25 flange is a special version.

8.1.3 Indicator housing made of stainless steel





DN	PN	Inside diameter	A
15	40	26	100
25	40	32	103
40	40	46	110
50	40	70	122
80	16	102	138

Deviating mounting dimensions:

(1) 265 mm with the indicator pulled forward

8.2 Weight

Nominal size	Weight [kg]
DN 15	3
DN 25	4.2
DN 40	6
DN 50	7.5
DN 80	13
DN 100	18

Nominal size	Weight [kg]
¾“, 150 lbs, ANSI B16.5	3
1“, 150 lbs, ANSI B16.5	4.2
1 ½“, 150 lbs, ANSI B16.5	6
2“, 150 lbs, ANSI B16.5	7.5
3“, 150 lbs, ANSI B16.5	13
4“, 150 lbs, ANSI B16.5	18

Nominal size	Weight [kg]
¾“, 300 lbs, ANSI B16.5	3.4
1“, 300 lbs, ANSI B16.5	4.7
1 ½“, 300 lbs, ANSI B16.5	6.8
2“, 300 lbs, ANSI B16.5	8.5
3“, 300 lbs, ANSI B16.5	14.5
4“, 300 lbs, ANSI B16.5	20

8.3 Material

Fitting

Type	Measuring tube	Lining of measuring tube	Flanges	Flange lining	Float
BGN – S	Stainless steel	none	Stainless steel	none	Stainless steel
BGN – P	Stainless steel	PTFE	Stainless steel	PTFE	PTFE
BGN – H DN15/25 ¾"/1"	Hastelloy HC4	none	Hastelloy HC4	none	Hastelloy HC4
BGN – H > DN40 / 1½"	Hastelloy HC4	none	Stainless steel	Hastelloy HC4	Hastelloy HC4

Indicator

Type	Base plate	Housing
BGN – S/P/H	Aluminum	Aluminum, safety glass window
Optional	Stainless steel	Stainless steel, safety glass window

8.4 Process connection

	BGN-S/H	**BGN-P**
DN 15	PN 40	PN 16
DN 25	PN 40	PN 16
DN 40	PN 40	PN 16
DN 50	PN 40	PN 16
DN 80	PN 40	PN 16
DN 100	PN 16	PN 16

	BGN S/ H		**BGN P**	
ANSI ¾" B16.5	150 lbs [1]	300 lbs [1]	150 lbs [2]	300 lbs [2]
ANSI 1" B16.5	150 lbs [1]	300 lbs [1]	150 lbs [2]	300 lbs [2]
ANSI 1 ½" B16.5	150 lbs [1]	300 lbs [1]	150 lbs [2]	300 lbs [2]
ANSI 2" B16.5	150 lbs [1]	300 lbs [1]	150 lbs [2]	300 lbs [2]
ANSI 3" B16.5	150 lbs [1]	300 lbs [1]	150 lbs [2]	300 lbs [2]
ANSI 4" B16.5	150 lbs [2]	300 lbs [2]	150 lbs [2]	300 lbs [2]

1) Entire device PN 40 2) Entire device PN 16

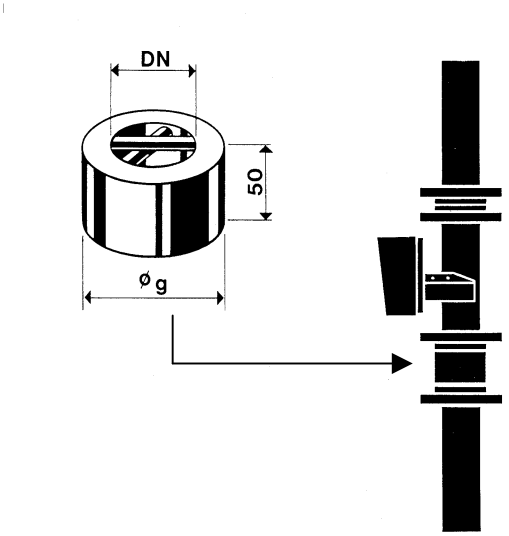
Additional equipment: special flanges, union, food connection, welding connection

The S/H versions in special design are available up to PN 400.

8.5 Magnetic filter

The BGN flowmeter is sensitive to impure media. Before installing the device, clean the pipes of dirt, spatter and other foreign matter. If the medium comes with solid particles, connect a suitable filter in series. When dealing with flow media with ferrous particles, we recommend the connection of a magnetic filter.

To protect both magnetic filter types, MF-S (stainless steel) and MF-P/S (PTFE/stainless steel), from corrosion, encapsulated permanent magnets are laid out in spiral form. The spiral mounting produces optimum effect at small pressure loss. The filter can be supplied with groove or tongue, projection or return, other standards or special connections according to customer wishes.



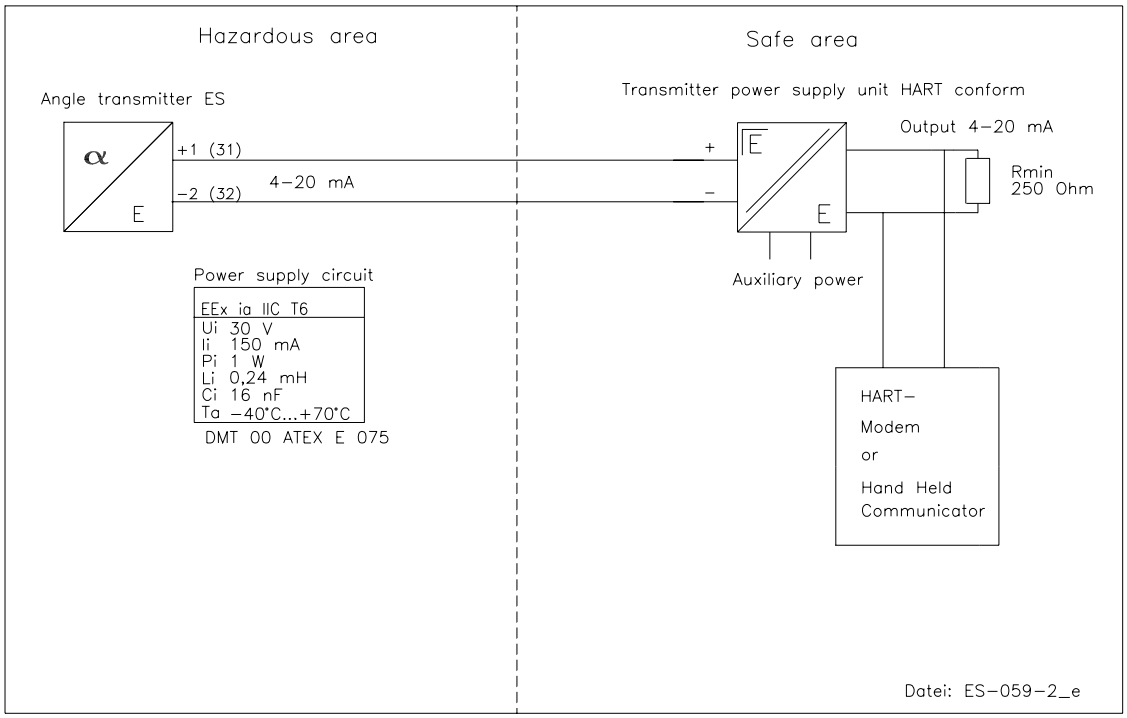
Dimensions:

DN	g (mm)
15	45
25	68
40	88
50	102
65	122
80	138
100	158

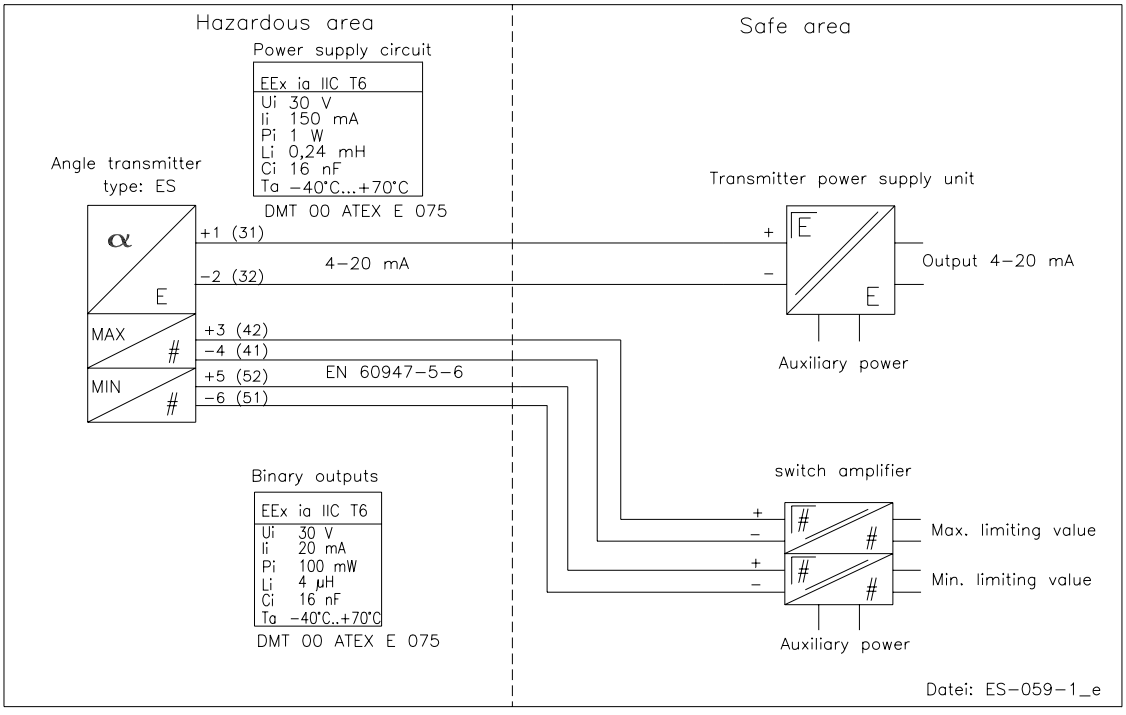
8.6 Electrical connection

Wiring
To connect the auxiliary power, remove the indicator cover, insert the connector cable into the cable gland and attach it to the terminals according to terminal diagram. Tighten the cable gland securely, remount the indicator cover and close it tightly.

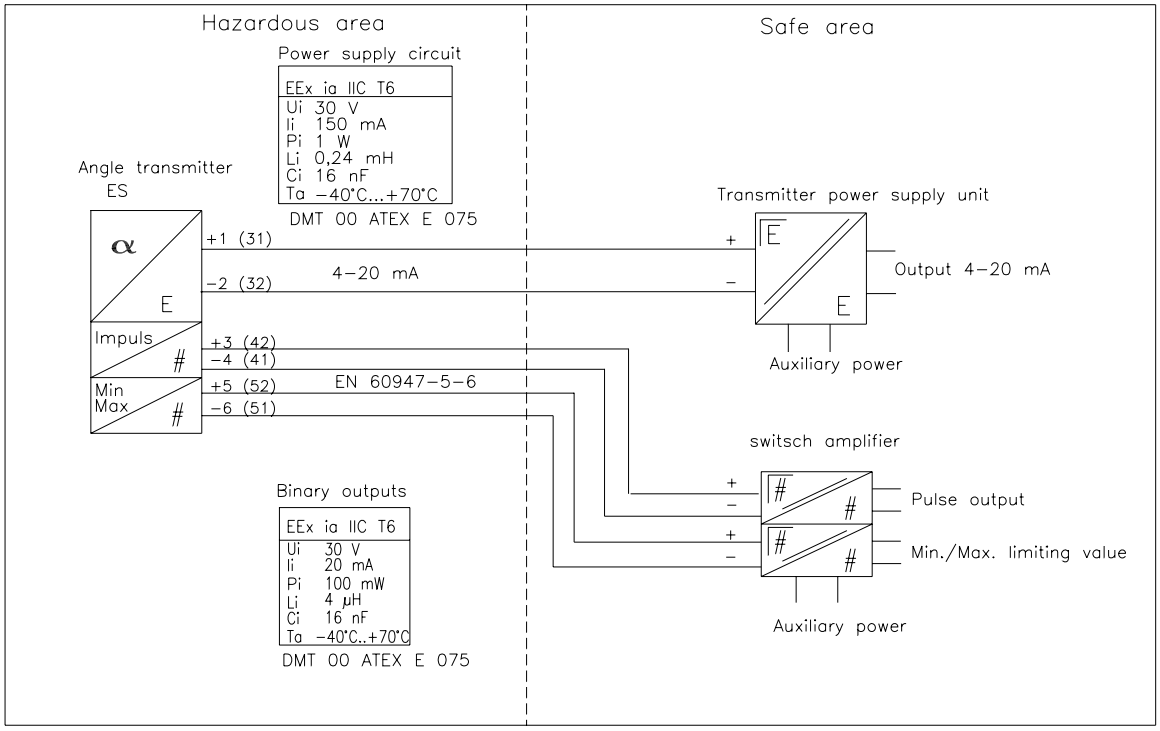
8.6.1 Wiring diagram for ES transmitter (signal output 4-20 mA with HART®)



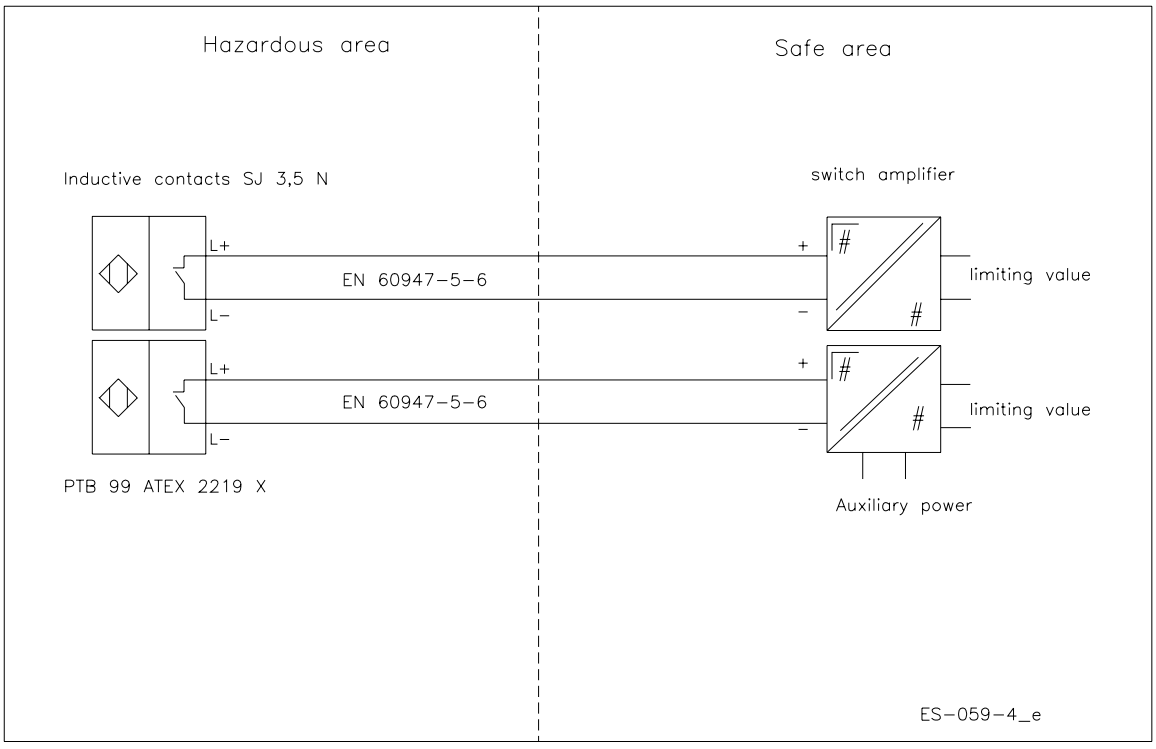
8.6.2 Wiring diagram for ES transmitter with 4-20 mA output and 2 limit transducers



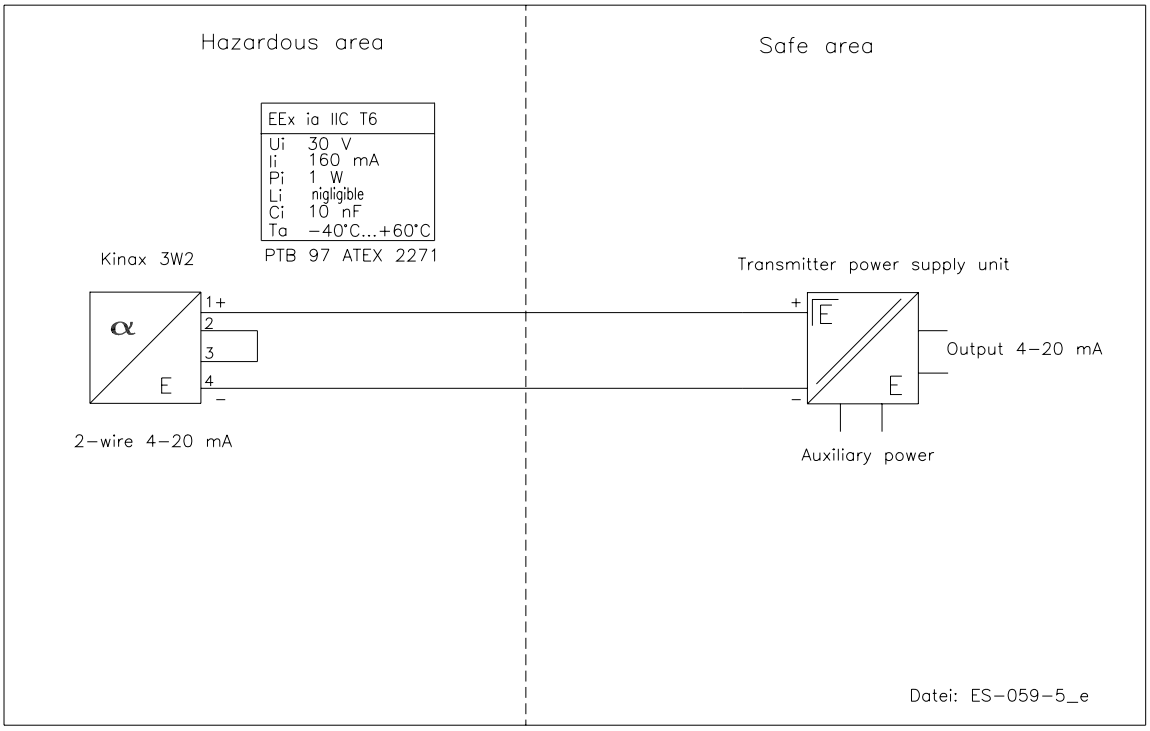
8.6.3 Wiring diagram for ES transmitter with 4- 20 mA output, pulse output and limit transducer



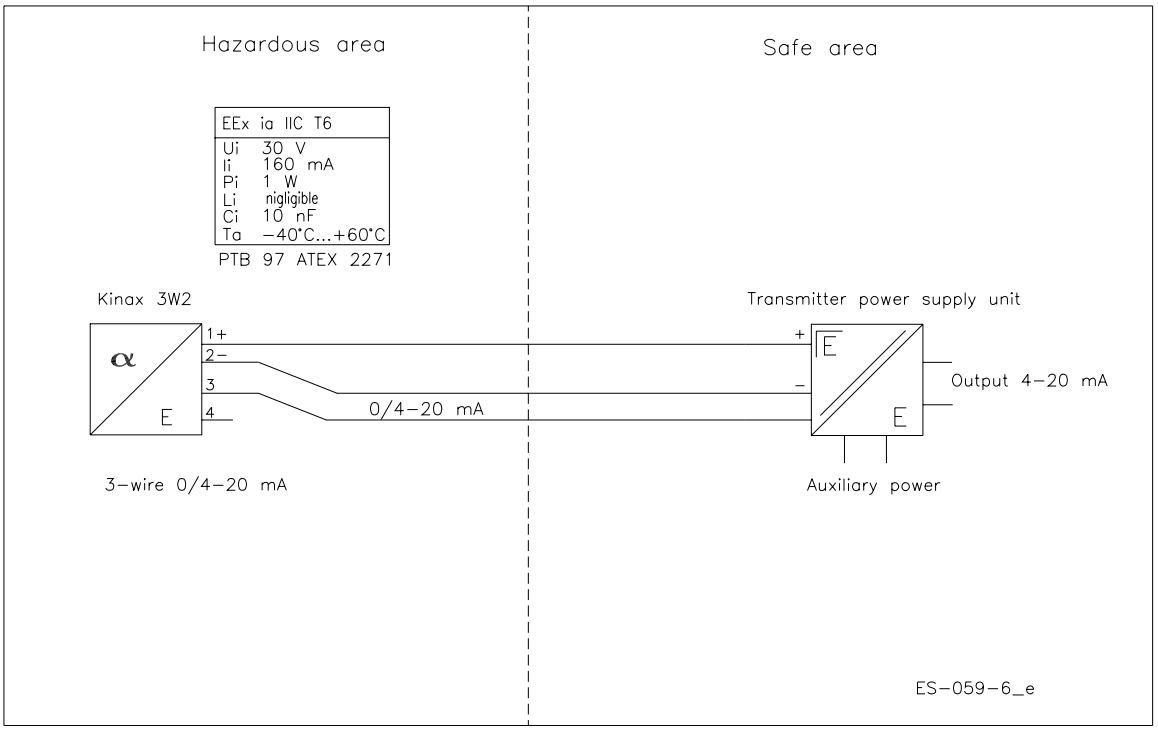
8.6.4 Wiring diagram for inductive limit transducers



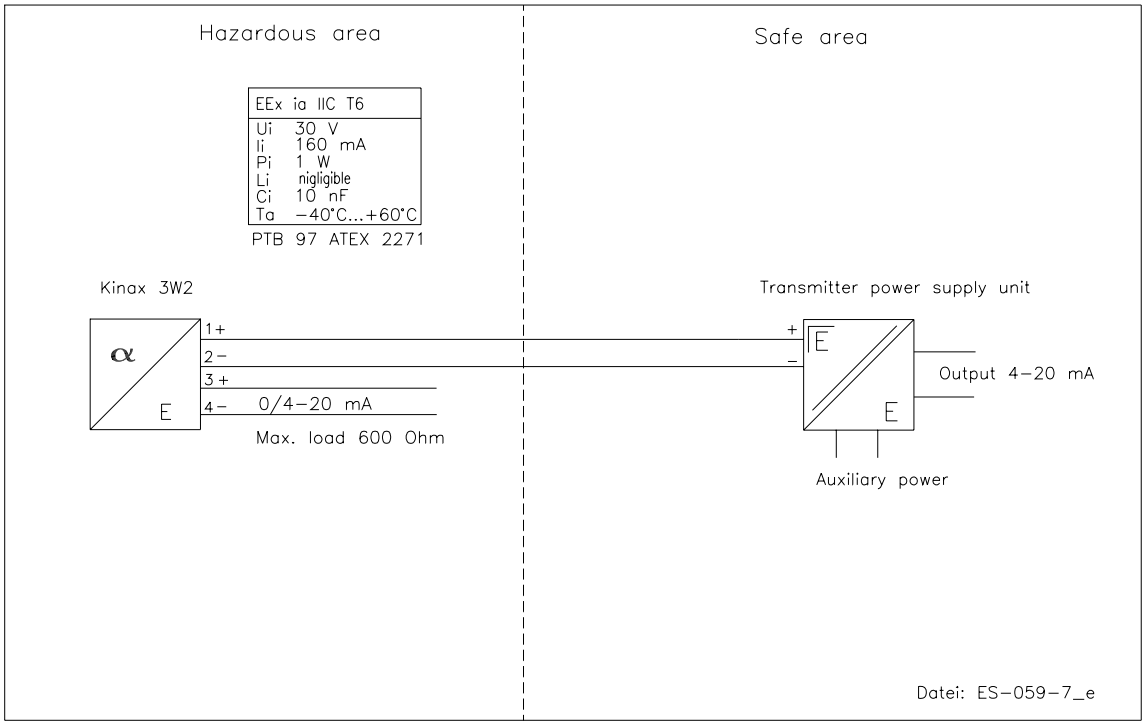
8.6.5 Wiring diagram for KINAX 3W2 transmitter with 4-20 mA output, 2 wires



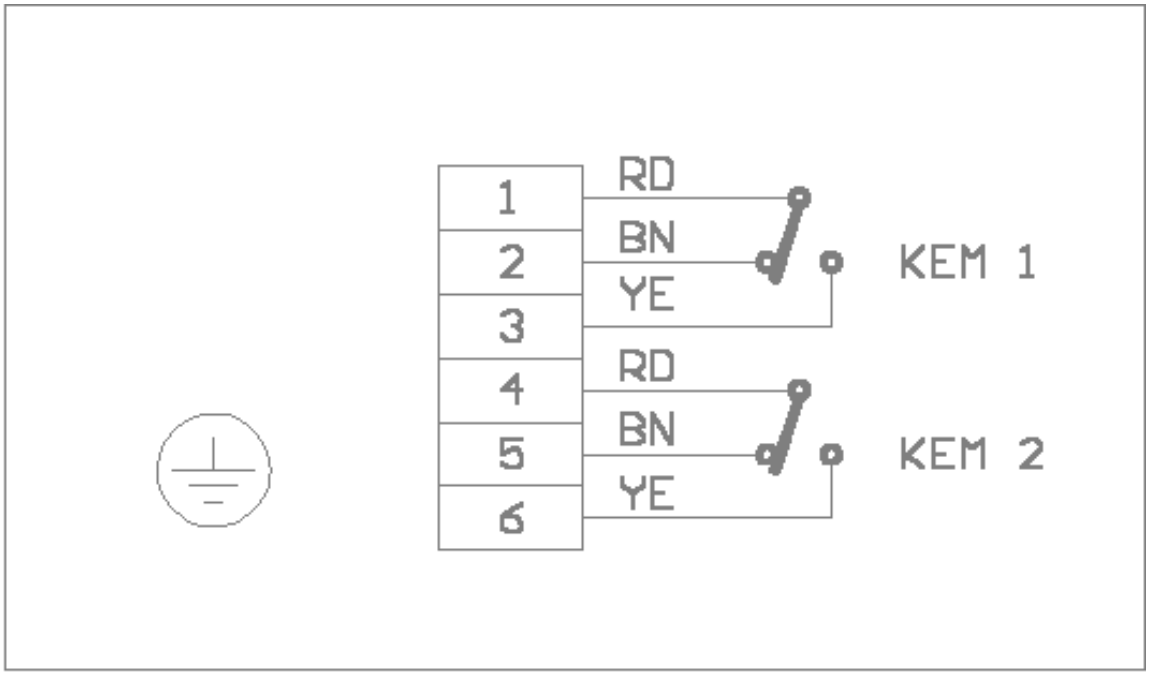
8.6.6 Wiring diagram for KINAX 3W2 transmitter with 4-20 mA output, 3 wires



8.6.7 Wiring diagram for KINAX 3W2 transmitter with 4-20 mA output, 4 wires



8.6.8 Wiring diagram for KEM 1 and KEM 2 double-throw microswitches



9 Indicator unit

- Analog indicator approx. 90° with pointer
- Customized product scale
- ES transmitter with freely programmable user interface
- Parameters may be changed based on the ES Operating Instructions.

10 Auxiliary power

see Electrical connection

11 CE mark

The measuring system meets the statutory requirements of the following EU directives: Directive 94/9/EC (Equipment and Protective Systems for Use in Potentially Explosive Atmospheres), the Electromagnetic Compatibility (EMC) Directive 89/336/EEC and the Pressure Equipment Directive 97/23/EC.

Measuring sensors with a connection nominal size equal to or smaller than or DN 25 fall within the scope of application of Article 3, section 3, of the Pressure Equipment Directive and need no CE mark in accordance with this directive.

Heinrichs Messtechnik confirms compliance with the directives by attaching the CE mark.

12 Order information

Please include the following information in your order: Product data, specific weight, temperature, pressure, viscosity, material design, connection size, measuring range, desired accessories, required approvals and material certificates. **See Device selection by model code.**

12.1 Available accessories

- Stainless steel indicator unit, glass window IP 66
- Indicator unit for high or low temperatures pulled forward by 100 mm
- Fitting with heating or cooling jacket (with Ermeto or flange connection)
- Float system with viscous damping
- Float system with gas damping
- Float system with spring stop
- 1 or 2 inductive limit transducers
- KINAX or ES electric transmitter
- Drainable fitting (pump has been disconnected)
- Magnetic filter

13 Standards and directives, certificates and approvals

- Certified to DIN-EN 9001
- Production in accordance with AD guidelines and HPO approval (TRB200/TRD201)
- TÜV approval for welding requirements in accordance with DIN-EN 729-2
- Measuring range rated and converted to other products according to VDE/VDI guidelines 3513
- Directive 94/9/Ec (Equipment and Protective Systems for Use in Potentially Explosive Atmospheres)
- EN 50014:1997+A1-A2 - General requirements
- EN 50020:1994 - Intrinsic safety “i”
- Directive 89/336/EEC (EMC Directive)
- EN 61000-6-2:1999 – Immunity industrial environment
- EN 50 081-1 – Emitted interference residential environment
- EN 55011:1998+A1:1999 – Group 1, Class B
- NAMUR recommendation NE 21
- EN 60529 – Degrees of protection through housing (IP code)
- EN 61010 – Safety requirements for electrical measuring, control and laboratory devices
- EN 60947-5-6:2000 – Switchgear and controlgear
- Directive 97/23/EC (Pressure Equipment Directive)

14 Replacement parts

The following parts can be ordered as replacement parts:

1) Indicator cover with window/gasket/screws
2) Scale with standard scaling
3) Pointer
4) Limit value indicator
5) Pointer stop
6) Float with guides and safety screw
7) Spring stop
8) Complete gas damping set with float
9) Complete viscous damping set with float
10) Screwed cone set with float for small measuring range up to 40 l/h
11) Limit value initiatior

15 Exploded views

15.1 Fitting with measuring element

Name (Figures 12-15)	Part no.
BGN - Fitting	1
BGN - Fitting with Spring stop for float	2
Float	3
Float with damping piston	4
Spring stop	5
gas damping	6
gas damping with Spring stop	7

15.1.1 BGN-.... Standard version

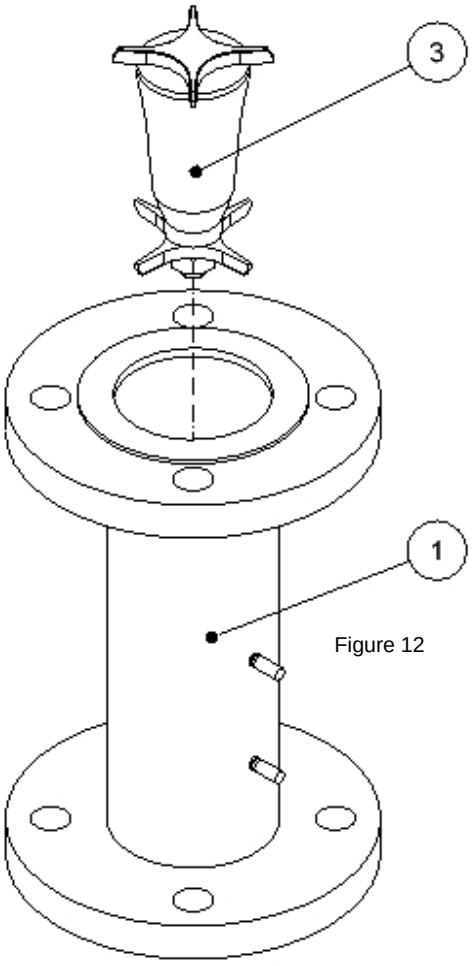


Figure 12

15.1.2 BGN-.... with spring stop

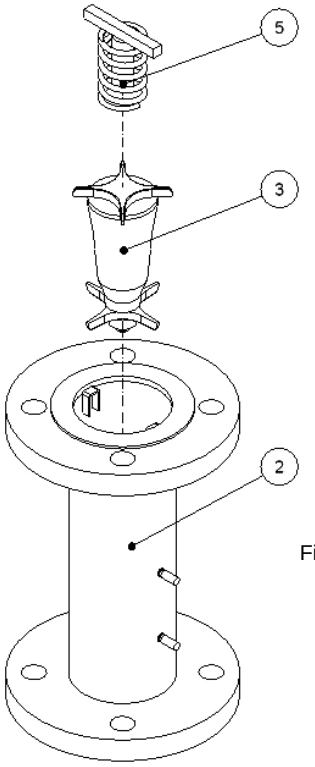


Figure 13

15.1.3 BGN-.... with damping piston

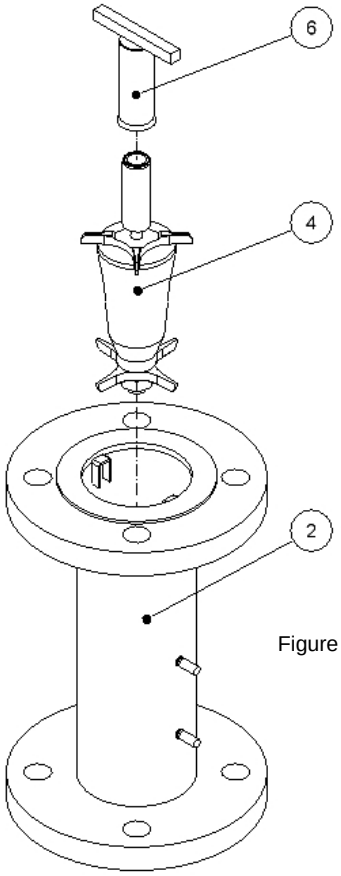


Figure 14

15.1.4 BGN-.... with damping piston and spring stop

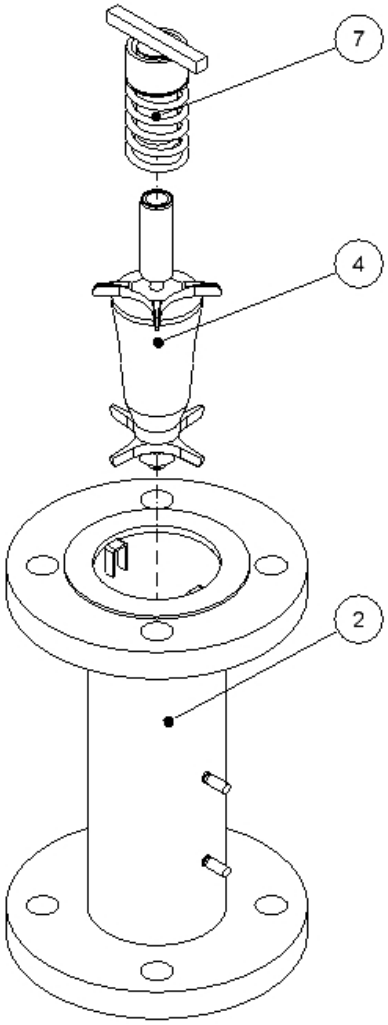


Figure 15

15.1.5 BGN-.... small measuring ranges

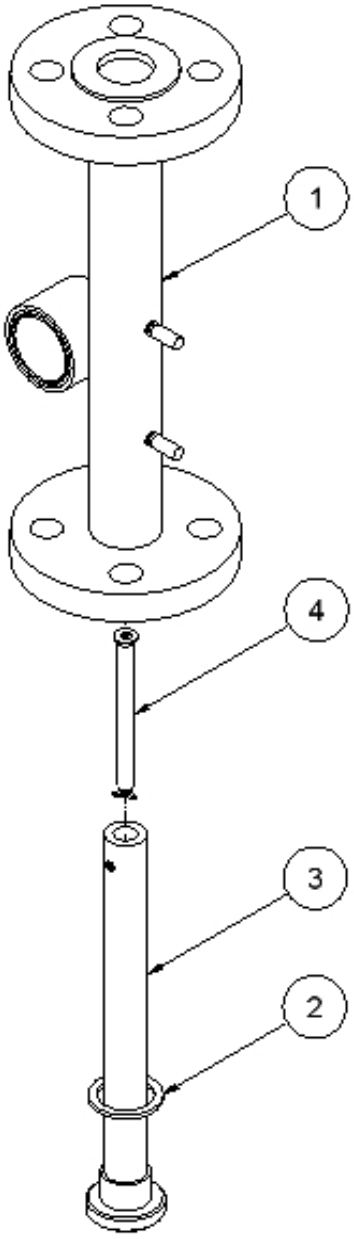


Figure 16

Name (Figures 16)	Part no.
Fitting for small measuring range	1
gasket	2
Cone with spring stop	3
Float	4

15.2 Indicator unit

Name	Part no.
Mounting plate with 1 thread M 20 x 1.5	10
Mounting plate with 2 threads M 20 x 1.5	11
Bearing unit	20
Fixing screws for bearing unit	30
Dummy plug M 20 x 1.5	40
Cable gland	41
Cable gland	42
Scale, blank	50
Scale, product scale according to original shipment (order no. necessary)	51
Screw for fixing the scale	60
Zero-point screw with nut	70
Indicator cover with glass window, gasket, screws	80
Scale pointer with hub	90
Scale pointer with hub and 2 switching dials	91
Scale pointer with hub and linearization disc	92
Scale pointer with hub and linearization disc/switching dial	93
Scale pointer with hub and 2 switching dials and ES position magnet	94
1. SJ 3,5 N limit transducer with limit value indicator	110
1. SJ 3,5 SN limit transducer with limit value indicator	111
2. SJ 3,5 N limit transducer with limit value indicator	120
2. SJ 3,5 SN limit transducer with limit value indicator	121
Connection plate for 1 limit transducer with mounting parts	130
Connection plate for 2 limit transducers with mounting parts	131
Installation set for transmitter type KINAX 3W2 Ex with lever arm and mounting parts	132
Installation set transmitter type KINAX 3W2 Ex with lever arm and mounting parts and connection for a limit transducer	133
Installation set transmitter ES Ex Hart	140
Installation set transmitter ES Ex with switch (min-max)	141
Installation set transmitter ES Ex with Profibus	142

15.2.1 Complete indicator unit, local with scale

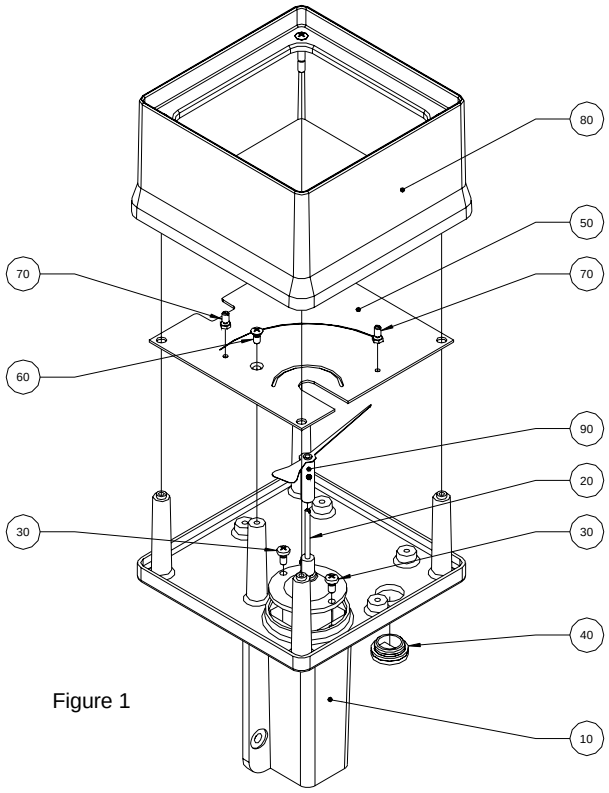


Figure 1

15.2.2 Complete indicator unit with 1 SJ 3,5 N limit transducer

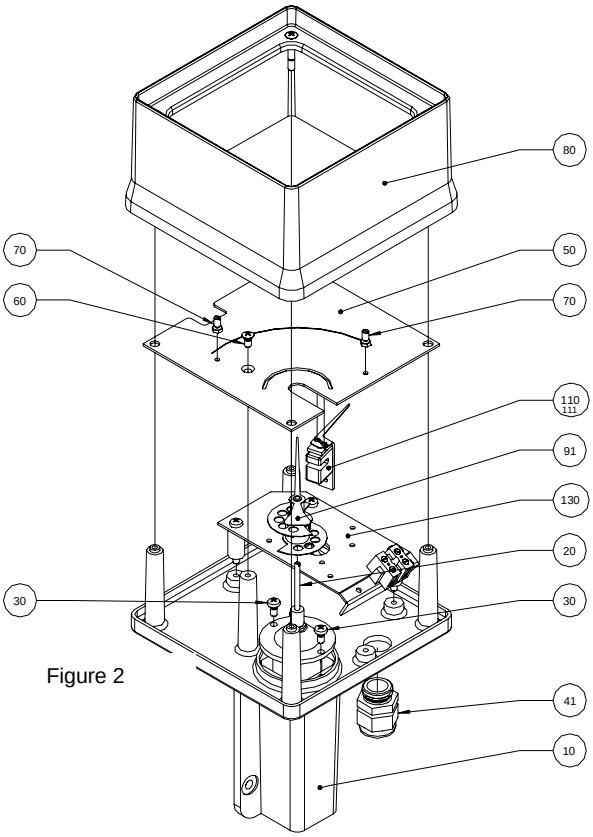


Figure 2

15.2.3 Complete indicator unit with 2 SJ 3,5 N limit transducers

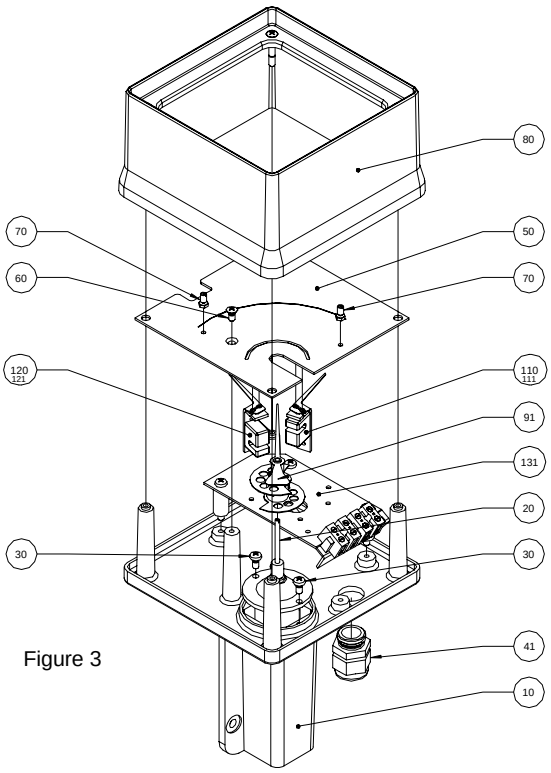


Figure 3

15.2.4 Complete indicator unit with E2 KINAX Ex transmitter

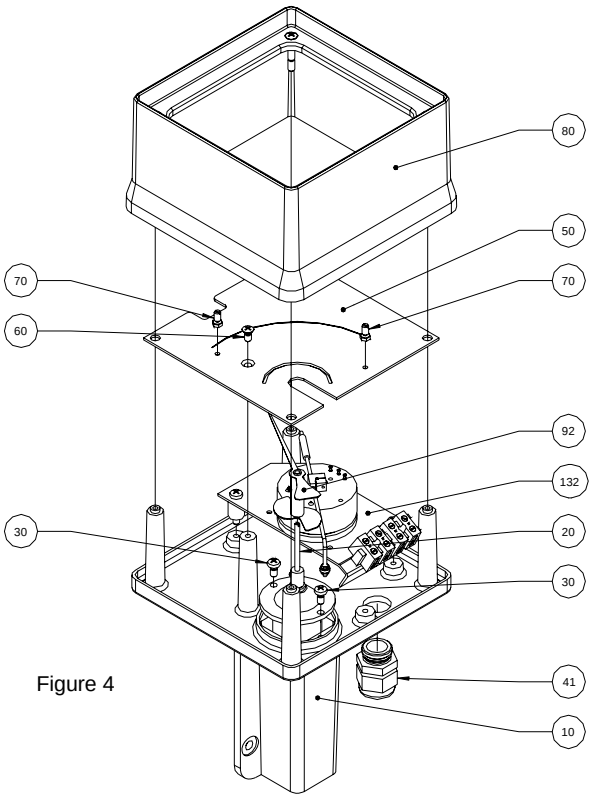


Figure 4

15.2.5 Complete indicator unit with E2 KINAX Ex transmitter and 1 SJ 3,5 N limit transducer

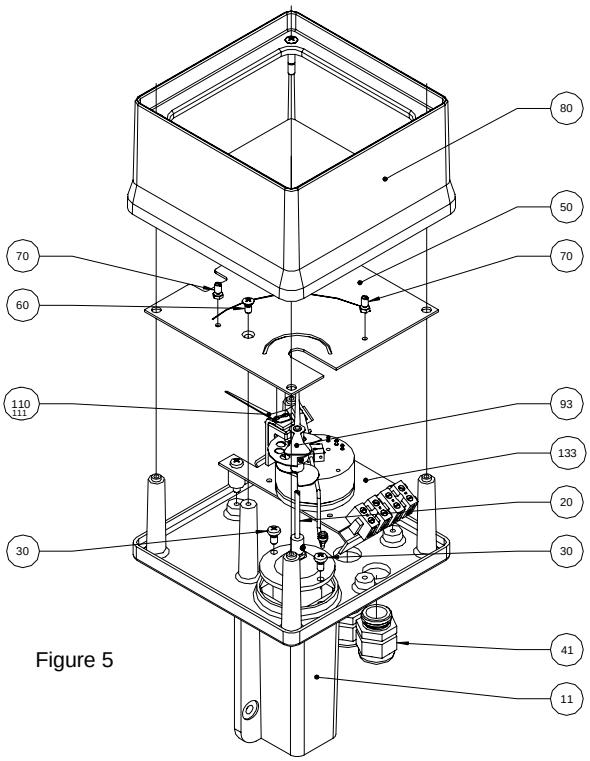


Figure 5

15.2.6 Indicator unit with transmitter type ES Ex HART®

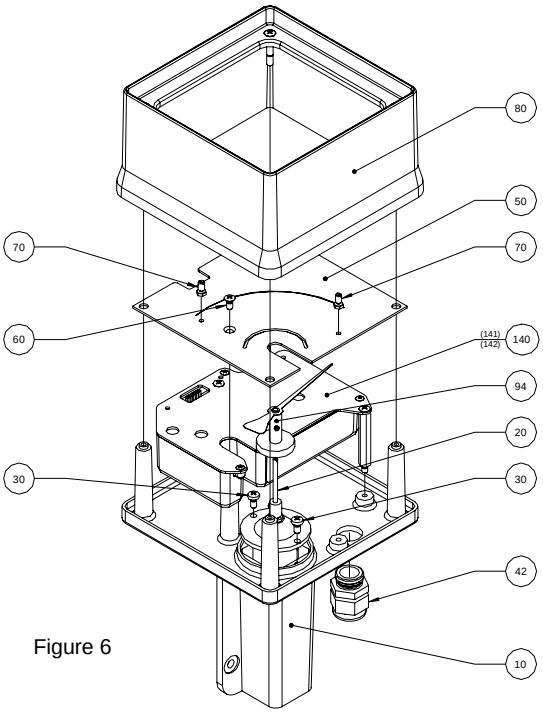


Figure 6

Name	Part no.
Mounting plate with 1 thread M 20 x 1.5	10
Mounting plate with 2 threads M 20 x 1.5	11
Bearing unit	20
Fixing screws for bearing unit	30
Dummy plug M 20 x 1.5	40
Cable gland	41
Cable gland	42
Scale, blank	50
Scale, product scale according to original shipment (order no. necessary)	51
Screw for fixing the scale	60
Zero-point screw with nut	70
Indicator cover with glass window, gasket, screws	80
Scale pointer with hub	90
Scale pointer with hub and 2 switching dials	91
Scale pointer with hub and linearization disc	92
Scale pointer with hub and linearization disc/switching dial	93
Scale pointer with hub and 2 switching dials and ES position magnet	94
1. SJ 3,5 N limit transducer with limit value indicator	110
1. SJ 3,5 SN limit transducer with limit value indicator	111
2. SJ 3,5 N limit transducer with limit value indicator	120
2. SJ 3,5 SN limit transducer with limit value indicator	121
Connection plate for 1 limit transducer with mounting parts	130
Connection plate for 2 limit transducers with mounting parts	131
Installation set for transmitter type KINAX 3W2 Ex with lever arm and mounting parts	132
Installation set transmitter type KINAX 3W2 Ex with lever arm and mounting parts and connection for a limit transducer	133
Installation set transmitter ES Ex Hart	140
Installation set transmitter ES Ex with switch (min-max)	141
Installation set transmitter ES Ex with Profibus	142

DMT

Translation

(1) # EC-Type Examination Certificate

(2) **- Directive 94/9/EC -**
Equipment and protective systems intended for use in potentially explosive atmospheres

(3) ## DMT 00 ATEX E 075

(4) **Equipment:** **Electronic transmitter type ES or ES-PPA**

(5) **Manufacturer:** **Bopp & Reuther Heinrichs Messtechnik Josef Heinrichs GmbH & Co. Messtechnik KG**

(6) **Address:** **D 50933 Köln**

(7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.

(8) The certification body of Deutsche Montan Technologie GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The examination and test results are recorded in the test and assessment report BVS PP 00.2071 EG.

(9) The Essential Health and Safety Requirements are assured by compliance with:

EN 50014:1997+A1-A2 General requirements
EN 50020 :1994 Intrinsic safety 'i'

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. Further requirements of Directive 94/9/EC apply to the manufacture and placing on the market of this equipment.

(12) The marking of the equipment shall include the following:

II 2G EEx ia IICT6

Deutsche Montan Technologie GmbH
Essen, dated 31. Oktober 2000

Signed: Jockers
DMT-Certification body

Signed: Dill
Head of special services unit

Am Technologiepark 1, 45307 Essen, Telefon (0201)172-1416, Telefax (0201)172-1716

DMT

(13) Appendix to

(14) # EC-Type Examination Certificate

DMT 00 ATEX E 075

(15) 15.1 Subject and type
Electronic transmitter type ES or ES-PPA

15.2 Description
The electronic transmitter serves for the recording of the position or angular position of a magnet at rotameters.
The completely encapsulated electronic device of the transmitter is mounted in a light alloy housing together with corresponding terminals for the connection of the intrinsically safe circuits. The transmitter is provided to be installed in a housing with a min. degree of protection IP 20.

15.3 Parameters

15.3.1 type ES

15.3.1.1 Input circuit (terminals 1 and 2)

voltage	Ui	DC	30	V
current	Ii		150	mA
power	Pi		1	W
effective internal inductance	Li		0,24	mH
effective internal capacitance	Ci		16	nF

15.3.1.2 Binary outputs 1 and 2: potentially free optocoupler circuits (terminals 3 - 4 and 5 - 6), each

voltage	Ui	DC	30	V
current	Ii		20	mA
power	Pi		100	mW
effective internal inductance	Li		4	µH
effective internal capacitance	Ci		16	nF

15.3.2 type ES-PPA Input circuit (terminals 7 and 8)
for connection with a circuit in accordance with FISCO model (PTB report no. PTBW-53)

voltage	Ui	DC	25	V
current	Ii		280	mA
power	Pi		2	W
effective internal inductance	Li		negligible	
effective internal capacitance	Ci		negligible	

15.3.3 ambient temperature range Ta - 40 °C up to + 70 °C

Am Technologiepark 1, 45307 Essen, Telefon (0201)172-1416, Telefax (0201)172-1716

DMT

(16) Test and assessment report
BVS PP 00.2071 EG as of 31. Oktober 2000

(17) Special conditions for safe use
None

We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

45307 Essen, dated 31.10.2000
BVS-Schu/Kn A 20000463

Deutsche Montan Technologie GmbH

DMT-Certification body

Head of special services unit

Am Technologiepark 1, 45307 Essen, Telefon (0201)172-1416, Telefax (0201)172-1716

Physikalisch-Technische Bundesanstalt

PTB

Braunschweig und Berlin

(1) # EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 97 ATEX 2271

(4) Equipment: Transmitter for angular position KINAX 3W2 type 708-...
resp. KINAX WT707 type 707-
... resp. KINAX WT706 type 706-...

(5) Manufacturer: Camille Bauer AG

(6) Address: Aargauerstrasse 7, CH-5610 Wohlen

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 97-27381.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50014:1997 **EN 50020:1994**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:

Ex II 2 G EEx ia IIC T6

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 21.01.1998

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Sheet 1/3

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(13) **SCHEDULE**

(14) **EC-TYPE-EXAMINATION CERTIFICATE No. PTB 97 ATEX 2271**

(15) Description of equipment

The angular position transmitter KINAX 3W2 of type 708-..., KINAX WT 707 of type WT 707-... and KINAX WT 706 of type WT 706-... convert the angular position of a shaft contactlessly to a proportional electrical output signal.

A variation of the shaft position effects a variation of a capacitance, which is converted to a proportional current alteration by the downstream electronics.

The ranges of the ambient temperature dependent on the temperature class are shown in the following table.

Minimum ambient temperature	Maximum ambient temperature	Temperature class
-40 °C	60 °C	T 6
-40 °C	75 °C	T 5

Electrical data

Supply- and measuring output (terminals 1, 2, 3) ..... type of protection Intrinsic Safety EEx ia IIC for connection to a certified intrinsically safe circuit only.

Maximum values: U_i = 30 V
I_i =160 mA
P_i = 1 W

Effective internal capacitance: $C_i \leq 10$ nF
The effective internal inductance is negligibly small.

The transmitter for angular position KINAX 3W2 of type 708-... must be mounted into a housing which meets the requirement of a degree of protection IP 20 according to IEC 529.

Since the angular position transmitters KINAX WT 707 of type WT 707-... and KINAX WT 706 of type WT 706-... meet the requirements of a degree of protection IP 20 according to IEC 529 mounting of these variants into an additional housing is not necessary.

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 97 ATEX 2271

(16) Report PTB Ex 97-27381

(17) Special conditions for safe use

not applicable

(18) Essential health and safety requirements

met by standards

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 21.01.1998

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(1) # EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 99 ATEX 2219 X

(4) Equipment: Slot-type initiators types SJ... and SC...

(5) Manufacturer: Pepperl + Fuchs GmbH

(6) Address: D-68307 Mannheim

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 99-29175.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014:1997 **EN 50020:1994**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:

Ex II 2 G EEx ia IIC T6

Zertifizierungsstelle Explosionsschutz Braunschweig, December 22, 1999

By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(13) # SCHEDULE

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X**

(15) Description of equipment

The slot-type initiators of types SJ... and SC... are used to convert displacements into electrical signals.

The slot-type initiators may be operated with intrinsically safe circuits certified for categories and explosion groups [EEx ia] IIC or IIB resp. [EEx ib] IIC or IIB. The category as well as the explosion group of the intrinsically safe slot-type initiators depends on the connected supplying intrinsically safe circuit.

Electrical data

Evaluation and supply circuit.....type of protection Intrinsic Safety EEx ia IIC/IIB
..... resp. EEx ib IIC/IIB
only for connection to certified intrinsically safe circuits
Maximum values:

type 1	type 2	type 3	type 4
U_i = 16 V	U_i = 16 V	U_i = 16 V	U_i = 16 V
I_i = 25 mA	I_i = 25 mA	I_i = 52 mA	I_i = 78 mA
P_i = 34 mW	P_i = 64 mW	P_i = 169 mW	P_i = 242 mW

The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type intiators are shown in the table:

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X

types	C_i	L_i	type 1			type 2			type 3			type 4		
			maximum permissible ambient temperature in °C for application in temperature class											
	[nF]	[µH]	T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1
SC2-N0...	150	150	72	87	100	65	80	100	40	55	75	23	38	54
SC3,5-N0-Y...	150	150	72	87	100	65	80	100	40	55	75	23	38	54
SC3,5...-N0...	150	150	73	88	100	66	81	100	45	60	89	30	45	74
SJ1,8-N-Y...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ2,2-N...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ2-N...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ3,5-...-N...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ3,5-H...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ5-...-N...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ5-K...	50	550	72	87	100	66	81	100	42	57	82	26	41	63
SJ10-N...	50	1000	72	87	100	66	81	100	42	57	82	26	41	63
SJ15-N...	150	1200	72	87	100	66	81	100	42	57	82	26	41	63
SJ30-N...	150	1250	72	87	100	66	81	100	42	57	82	26	41	63

(16) Test report PTB Ex 99-29175

(17) Special conditions for safe use

1. For the application within a temperature range of -60°C to -20 °C the slot-type initiators of types SJ... and SC... must be protected against damage due to impact by mounting into an additional housing.
2. The connection facilities of the slot-type initiators of types SJ... and SC... shall be installed as such that at least a degree of protection of IP20 according to IEC-publication 60529:1989 is met.
3. The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type initiators is shown in the table given under item (15) of this EC-type-examination certificate..
4. Inadmissible electrostatic charge of the plastic housing of the slot-type initiators of type SJ30-N..., has to be avoided (warning label on the device).

(18) Essential health and safety requirements

Met by the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Braunschweig, August 10, 1999

sheet 3/3

17 Sales representatives

Internet: http://www.heinrichs-mt.com/

18 Notes